CLAIMS

We claim:

1. A method for generating parametric audio output based on interaction of multiple ultrasonic frequencies within air as a nonlinear medium, said method comprising the steps of:

a) generating an electronic signal comprising at least two ultrasonic signals having a difference in value which falls within an audio frequency range;

b) transferring the electronic signal to an electro acoustical film transducer diaphragm which couples directly with the air as part of a single stage energy conversion process;

c) converting the electronic signal at the diaphragm directly to mechanical displacement as a driver member of a parametric speaker; and

d) mechanically emitting the at least two ultrasonic signals from the diaphragm into the air as ultrasonic compression waves which interact within the air to generate the parametric audio output.

2. A method as defined in claim 1, wherein step b) comprises the more specific step of transferring the electronic signal to an electrostatic film transducer.

3. A method as defined in claim 1, wherein step b) comprises the more specific step of transferring the electronic signal to a piezo film diaphragm as the electro acoustical transducer diaphragm.

4. A method as defined in claim 1, wherein step b) comprises the more specific step of transferring the electronic signal to a thermally formed electro mechanical film diaphragm as the electro acoustical transducer diaphragm.

5. A method as defined in claim 1, wherein step b) comprises the more specific step of transferring the electronic signal to a planar magnetic film diaphragm as the electro acoustical transducer diaphragm.

6. A method as defined in claim 2, wherein step b) comprises the more specific step of transferring the electronic signal to an electrostatic backplate having a surface configuration comprising circular V grooves operable as a stator member with respect to the diaphragm.

7. A method as defined in claim 3, wherein step b) comprises the more specific step of transferring the electronic signal to a piezo film diaphragm having a configuration of a rectified sine form.

8. A method as defined in claim 7, wherein step b) comprises the more specific step of transferring the electronic signal to a piezo film diaphragm which is supported by a backplate having a configuration of a rectified sine form.

9. A method as defined in claim 3, wherein step b) comprises the more specific step of transferring the electronic signal to a piezo film diaphragm having a configuration of a sinusoidal form.

10. A method as defined in claim 9, wherein step b) comprises the more specific step of transferring the electronic signal to a piezo film diaphragm which is supported by a backplate having a configuration of a sinusoidal form.

11. A method as defined in claim 1, further comprising the step of selecting a transducer diaphragm having a dimension greater than the wavelength of the ultrasonic frequencies at their lowest frequency wavelength value.

12. A method as defined in claim 1, further comprising the step of selecting a transducer diaphragm having a dimension greater than ten times the wavelength of the ultrasonic frequencies at their lowest value.

13. A method as defined in claim 3, further comprising the step of selecting a transducer diaphragm having a convex curvature which generates a diffuse radiation pattern for emission of the parametric output.

14. A method as defined in claim 3, further comprising the step of selecting a transducer diaphragm having a concave curvature which generates a focused radiation pattern for emission of the parametric output.

15. A method as defined in claim 3, further comprising the step of selecting a transducer diaphragm having a dipolar propagation mode which generates a diffuse radiation pattern for emission of the parametric output.

16. A method as defined in claim 3, further comprising the step of spacing the transducer diaphragm a distance of a quarter wave of a selected frequency from a supporting backplate.

17. A method as defined in claim 16, further comprising the step of electronically driving film peaks out of phase with film troughs.

18. A method as defined in claim 3, further comprising the step of providing a dimpled transducer diaphragm comprising a monolithic sheet of film having closely spaced, concave dimples in side by side array which generate a substantially uniform and homogenous radiation pattern for emission of the parametric output across the surface of the diaphragm.

19. A speaker device for generating parametric audio output based on interaction of multiple ultrasonic frequencies within air as a nonlinear medium, said device comprising:

a) a parametric signal generation system including an ultrasonic signal source, an audio signal source, and a modulating device coupled to the ultrasonic and audio signal sources for mixing the ultrasonic and audio signals for generating a resultant electronic signal comprising at least two ultrasonic signals having a difference in value which falls within an audio frequency range;

b) an electro acoustical film transducer diaphragm coupled to the parametric signal generation system which also couples directly with the air as part of a single stage energy conversion process; and

c) support structure for positioning and stabilizing the diaphragm to enable mechanical displacement of the diaphragm as a driver member of a parametric speaker.

20. A method as defined in claim 19, wherein the transducer comprises an electrostatic transducer.

21. A method as defined in claim 19, wherein the transducer comprises a piezo film diaphragm as the electro acoustical transducer diaphragm.

22. A method as defined in claim 19, wherein the transducer comprises a thermally formed electro mechanical film diaphragm as the electro acoustical transducer diaphragm.

23. A method as defined in claim 19, wherein the transducer comprises a magnetic film diaphragm as the electro acoustical transducer diaphragm.

24. A method for enhancing parametric audio output based on interaction of multiple ultrasonic frequencies within air as a nonlinear medium, said method comprising the steps of:

a) generating an electronic signal comprising at least two ultrasonic signals having difference in value which falls within an audio frequency range;

b) transmitting the electronic signal to an emitter film transducer diaphragm having an array of arcuate emitter sections formed within the film;

c) electro-mechanically displacing the array of arcuate emitter sections in phase as a driver member of a parametric speaker; and

d) emitting the at least two ultrasonic signals from the diaphragm into the air as ultrasonic compression waves which interact within the air to generate the parametric audio output.

25. A method as defined in claim 24, wherein step c) comprises the more specific step of displacing the emitter sections in a controlled manner for minimizing saturation of surrounding air at the respective arcuate emitter sections as part of distortion reduction for the parametric speaker.

26. A method as defined in claim 24, wherein step d) comprises the more specific step of emitting the ultrasonic frequencies from the emitter sections in a collimated configuration.

27. A method as defined in claim 24, wherein step b) comprises the more specific step of transmitting the electronic signal to a piezo film diaphragm.

28. A method as defined in claim 27, wherein step b) comprises the more specific step of transmitting the electronic signal to a piezo film diaphragm having an array of circular, arcuate emitter sections.

29. A method as defined in claim 27, wherein step b) comprises the more specific step of transmitting the electronic signal to a piezo film diaphragm having an array of elongate, arcuate emitter sections.

30. A method as defined in claim 27, wherein step b) comprises the more specific step of transmitting the electronic signal to a piezo film diaphragm having an array of elongate, channel-shaped indentations positioned in substantial parallel relationship.

31. A method as defined in claim 27, wherein step b) comprises the more specific step of transmitting the electronic signal to a piezo film diaphragm having a configuration of a rectified sine form.

32. A method as defined in claim 27, wherein step b) comprises the more specific step of transmitting the electronic signal to a piezo film diaphragm which is supported by a backplate having a substantially planar configuration.

33. A method as defined in claim 27, wherein step b) comprises the more specific step of transmitting the electronic signal to a piezo film diaphragm

having a substantially planar configuration, except for the arcuate emitter sections which extend slightly from the planar configuration.

34. A method as defined in claim 24, further comprising the step of selecting a transducer diaphragm having an emitter dimension greater than the wavelength of the ultrasonic frequencies at their lowest value.

35. A method as defined in claim 24, further comprising the step of selecting a transducer diaphragm having an emitter dimension greater than ten times the wavelength of the ultrasonic frequencies at their lowest value.

36. A method as defined in claim 24, further comprising the step of selecting a transducer diaphragm having an overall convex curvature which generates a diffuse radiation pattern for emission of the parametric output.

37. A method as defined in claim 24, further comprising the step of selecting a transducer diaphragm having an overall concave curvature which generates a focused radiation pattern for emission of the parametric output.

38. A method as defined in claim 37, further comprising the step of correlating rate of attenuation of ultrasonic emission resulting from absorption of ultrasonic energy within the air based upon frequency values, with radius for the concave curvature of the diaphragm, said radius being selected to at least compensate for

ultrasonic energy loss by focusing ultrasonic emissions into a converging ultrasonic beam.

39. A method as defined in claim 24, further comprising the step of spacing the transducer diaphragm a distance of a quarter wave of a selected frequency from a supporting backplate.

40. A method as defined in claim 39, wherein the selected frequency is a carrier frequency.

41. A method as defined in claim 27, further comprising the step of providing a dimpled transducer diaphragm comprising a monolithic sheet of film having closely spaced concave dimples in closely spaced, side by side array which generates a substantially uniform and homogenous radiation pattern for emission of the parametric output across the surface of the diaphragm.

42. A method as defined in claim 27, wherein step b) comprises the more specific step of transmitting the electronic signal to a backplate having a configuration including openings aligned with the arcuate emitter sections and having sufficient depth to allow free vibration of the arcuate emitter sections of the diaphragm.

43. A method for enhancing parametric audio output based on interaction of multiple ultrasonic frequencies within air as a nonlinear medium, said method comprising the steps of:

a) generating an electronic signal comprising at least two ultrasonic signals having a difference in value which falls within an audio frequency range;

b) concurrently transferring the electronic signal to an array of arcuate emitter sections formed within a common electro acoustical film transducer diaphragm;

c) displacing the emitter sections in a controlled manner for minimizing saturation of surrounding air at the respective arcuate emitter sections as part of distortion reduction for the parametric speaker;

d) electro-mechanically displacing the array of arcuate emitter sections in phase as a driver member of a parametric speaker;

e) emitting the at least two ultrasonic signals from the diaphragm into the air as ultrasonic compression waves; and

e) interacting the ultrasonic compression waves within the air to generate the parametric audio output.

44. A method as defined in claim 43, wherein step c) comprises the more specific step of limiting the electronic signal based on a weighted relationship between sound pressure level, ultrasonic frequency and size of emitter sections, with a maximum electronic signal limit which prevents continuous distortion of audio output by minimizing saturation of surrounding air at the respective arcuate emitter sections.

45. A method as defined in claim 44, wherein step c) comprises the more specific step of limiting the sound pressure level for all emitter sections to less than 140 db.

46. A speaker device for generating parametric audio output based on interaction of multiple ultrasonic frequencies within air as a nonlinear medium, said device comprising:

a) a parametric signal generation system including an ultrasonic signal source, an audio signal source, and a modulating device coupled to the ultrasonic and audio signal sources for mixing the ultrasonic and audio signals for generating a resultant electronic signal comprising at least two ultrasonic signals having a difference in value which falls within an audio frequency range;

b) an electro acoustical film transducer diaphragm having an array of arcuate emitter sections coupled to the parametric signal generation system; and

c) support structure coupled to the diaphragm and having aligned cavities with the array of arcuate emitter sections for positioning and stabilizing the arcuate emitter sections to enable mechanical displacement of the arcuate emitter sections in phase as a driver member of a parametric speaker.

47. A device as defined in claim 46, wherein the array of arcuate emitter sections are aligned and supported to propagate collimated beams of ultrasonic emissions for enhanced generation of parametric output.

48. A device as defined in claim 46, wherein the transducer comprises a piezo film diaphragm as the electro acoustical transducer diaphragm.

49. A device as defined in claim 46, wherein the arcuate emitter sections have a circular configuration.

50. A device as defined in claim 49, wherein the piezo film diaphragm includes isotropic properties which develop uniform electro-mechanical response throughout the arcuate emitter sections.

51. A device as defined in claim 46, wherein the arcuate emitter sections have an elongate configuration with an elongate axis.

52. A device as defined in claim 51, wherein the piezo film diaphragm includes anisotropic properties which develop greater electro-mechanical response perpendicular to the elongate axis of the arcuate emitter sections.

53. A device as defined in claim 51, further comprising a compartment coupled to the emitter sections wherein the compartment is maintained at a desired pressure different from ambient pressure and of sufficient strength to displace the diaphragm into curvature as an emitter section.

54. A device as defined in claim 53, wherein the desired pressure comprises a negative pressure level compared to the ambient pressure, thereby drawing the diaphragm into the aligned cavities.

55. A device as defined in claim 53, further comprising means coupled to the compartment for permanent sealing of the compartment with the desired pressure.

56. A method for enhancing parametric audio output based on interaction of multiple ultrasonic frequencies within air as a nonlinear medium, said method comprising the steps of:

a) generating an electronic signal comprising at least two ultrasonic signals, including an ultrasonic carrier signal and at least one additional ultrasonic signal, having a difference in value with respect to the carrier signal which falls within an audio frequency range;

b) transmitting the electronic signal to an array of arcuate emitter sections formed within a common electro acoustical film transducer diaphragm which has a primary axis of propagation;

c) configuring the array of emitter sections in a generally concave form for providing convergence of emitted ultrasonic beams from at least an outer perimeter of the array with a predetermined angle of convergence with respect to the primary axis of propagation;

d) electro-mechanically displacing the array of arcuate emitter sections in phase as a driver member of a parametric speaker;

e) emitting the at least two ultrasonic signals from the diaphragm into the air as ultrasonic compression waves; and

f) interacting the ultrasonic compression waves within the air to generate the parametric audio output.

57. A method as defined in claim 56, wherein the step of configuring the array includes selecting the angle of convergence based on a need for compensation for energy losses by ultrasonic energy absorbed within the air.

58. A method as defined in claim 56, wherein the step of configuring includes selecting an angle of convergence which adds ultrasonic energy along the primary axis of propagation which approximately matches energy losses resulting from the absorption of ultrasonic energy by the air.

59. A method as defined in claim 58, wherein the step of configuring includes the additional step of computing ultrasonic energy loss by absorption based on selecting the angle of convergence to approximately match the computed energy loss at a selected region of space.

60. A method as defined in claim 58, comprising the more specific step of selecting an angle of convergence within a range of .1 to 5 degrees with respect to the primary axis of propagation.

61. A method as defined in claim 58, comprising the more specific step of selecting an angle of convergence of approximately 3 degrees with respect to the primary axis of propagation.

62. A transducer speaker component device for emitting parametric or ultrasonic compression waves into surrounding air for generation of an audio or subsonic output, said device being comprised of:

a generally hollow drum having a sidewall and first and second opposing ends;

a rigid emitter plate attached to the first end of the drum, said plate having an outer face oriented away from the drum and an inner face disposed toward an interior cavity of the drum, said emitter plate having a plurality of apertures extending between the outer and inner faces;

a thin piezoelectric film disposed across the apertures of the emitter plate;

electrical contact means coupled to the piezoelectric film for providing an applied electrical input;

pressure means coupled to the drum for developing a biasing pressure with respect to the thin film at the apertures to distend the film into an arcuate emitter configuration capable of constricting and extending in response to variations in the applied electrical input at the piezoelectric film to thereby create a compression wave in a surrounding environment.

63. A device as defined in claim 62, wherein the apertures comprise round openings extending through the emitter plate, said pressure means being operable to distend the thin film within the apertures in the arcuate emitter configuration.

64. A device as defined in claim 63, wherein the pressure means includes vacuum means within the interior cavity for developing a negative pressure at the thin film to draw the film into the arcuate emitter configuration toward the interior cavity of the drum.

65. A device as defined in claim 64, wherein the retaining means comprises a mask plate having apertures in common alignment with the apertures of the emitter plate, said film being sandwiched between the emitter plate and the mask plate.

66. A device as defined in claim 62, wherein the pressure means includes means for developing positive pressure at the thin film to push the film into the arcuate emitter configuration away from the emitter plate.

67. A device as defined in claim 63, wherein said device further includes a bottom plate coupled to the second end of the drum and sealing means for sealing the interior cavity of the drum to enable development of a pressure differential between the interior of the drum and the surrounding environment.

68. A device as defined in claim 62, wherein the electrical contact means comprises a conductive perimeter ring positioned over and in electrical contact with a perimeter of the thin film, said ring being coupled to a source for the applied electrical input.

69. A device as defined in claim 63, wherein the thin film comprises a polyvinylidiene di-flouride material.

70. A device as defined in claim 62, wherein the emitter plate comprises a disk with at least ten apertures closely and uniformly spaced about a central region of the disk.

71. A device as defined in claim 68, wherein the apertures are arranged in a honeycomb pattern for maximum density.

72. A device as defined in claim 66, further comprising acoustically absorbent material positioned within the interior cavity of the drum for reducing adverse impact of back waves received within the drum.

73. A device as defined in claim 62, further comprising the step of spacing the transducer film a distance of a quarter wave of a selected frequency from a supporting backplate.

74. A device as defined in claim 73, wherein the selected frequency is a carrier frequency.

75. A device as defined in claim 62, further comprising:

an ultrasonic frequency generator for supplying an ultrasonic signal to the piezoelectric film;

a sonic frequency generator for supplying a sonic signal which is to be modulated onto the ultrasonic signal;

a modulator coupled to the ultrasonic frequency generator and the sonic frequency generator to develop an ultrasonic carrier wave with modulated sonic wave;

transmission means coupled to the modulator for supplying the carrier wave and modulated sonic wave to the piezoelectric film for stimulating generation of a corresponding compression wave at the emitter plate.

76. A device as defined in claim 71, wherein the modulator comprises an amplitude modulating device.

77. A system for indirectly generating at least one new sonic or subsonic frequency from at least two ultrasonic frequencies of different value, said system comprising:

a generally hollow drum having a first end, a second end and an intermediate sidewall;

an emitter plate coupled to the first end of the drum and having an outer face and an inner face, said plate including a plurality of apertures extending from the inner face to the outer face;

a back cover coupled to the second end of the drum and being disposed so as to seal the second end of the hollow drum;

an electrically responsive membrane disposed on the emitter plate over the plurality of apertures;

a pressure regulator applied to the emitter plate and the membrane for distending the membrane at the apertures into an arcuate emitter configuration capable of generating a compression wave within an ultrasonic frequency range in response to an applied electrical input; and

an electrical signal source coupled to the membrane for developing a vibration response at the plurality of apertures and associated arcuate emitter configurations, wherein the vibrations operate as an ultrasonic frequency emitter for concurrently propagating (i) a first ultrasonic frequency and (ii) a second ultrasonic frequency which interacts with the first ultrasonic frequency within a compressible transmission medium to propagate a difference frequency within a sonic bandwidth.

78. The system as defined in claim 77 wherein the electrical signal source includes a modulating means coupled to the membrane to thereby supply electrical signals for generating the first and second ultrasonic frequencies as modulated output of an input ultrasonic frequency and a sonic frequency, said

first and second ultrasonic frequencies having a difference in value equal to the at least one new sonic or subsonic frequency.

79. An emitter for generating audio output from ultrasonic emissions into air, said emitter comprising a flexible piezoelectric membrane having a plurality of arcuate emitter configurations disposed across a surface of the membrane and configured to respond to an electrical signal corresponding to an ultrasonic frequency for generating ultrasonic compression waves into the air.

80. An emitter as defined in claim 79, further comprising a support plate coupled to the membrane for supporting the membrane with the arcuate emitter configurations for emitting ultrasonic compression waves into the air.

81. An emitter as defined in claim 79, wherein the support plate includes apertures aligned with the arcuate emitter configurations which allow the arcuate configurations to distend or constrict to modify the curvature of the membrane over the aperture in response to an applied voltage.

82. An emitter as defined in claim 80, wherein the support plate and membrane are configured to generate a uniform wave front of ultrasonic compression waves.

83. An emitter as defined in claim 82, wherein the arcuate configurations of the membrane are aligned to emit compression waves from the membrane along parallel axes.

84. An emitter as defined in claim 81, wherein the apertures are configured with common dimensions which are aligned with the emitter configurations of the membrane supported on the support plate.

85. An emitter as defined in claim 79, wherein the piezoelectric membrane includes electrical contacts for receiving a single signal to be applied to all of the emitter configurations of the membrane, thereby minimizing harmonic and phase distortion within the ultrasonic emissions.

86. An emitter as defined in claim 79, wherein the emitter configurations of the membrane are uniform in size, curvature and composition.

87. An emitter as defined in claim 79, wherein the emitter configurations are disposed across the surface of the membrane in a honeycomb configuration.

88. An emitter as defined in claim 80, the apertures allowing movement of the membrane [illegible]

89. An emitter as defined in claim 79, wherein the piezoelectric membrane is made of a polyvinylidiene di-fluoride composition, having isotropic properties.

90. An emitter as defined in claim 79, wherein the piezoelectric membrane is made of a composition having anisotropic properties.

91. A parametric speaker including a support plate and a thin piezoelectric film having ultrasonic emitter array for emission of ultrasonic compression waves into a nonlinear air medium.

92. A parametric speaker as defined in claim 91, wherein the ultrasonic emitter array comprises an array of arcuate emitter cells disposed across the piezoelectric film.

93. A parametric speaker as defined in claim 92, wherein the piezoelectric film comprises polyvinylidiene di-fluoride.

94. A parametric speaker device comprising:

an electrostatic emitter film which is responsive to an applied variable voltage to emit an ultrasonic signal including a desired sonic signal which is modulated onto the ultrasonic signal;

a first foam member having a forward face, an intermediate core section and a rear face;

at least said forward face being composed of a composition having sufficient stiffness to support the electrostatic film and including conductive properties which enable application of a variable voltage to the forward face to supply the desired sonic signal;

said forward face comprising a surface including small cavities having surrounding wall structure defining each cavity, said surrounding wall structure

terminating at contacting edges approximately coincident with the forward face of the foam member;

film application means for applying the electrostatic film to the forward face of the foam member;

biasing means for biasing the film in direct contact with the contacting edges of the forward face such that the film is directly supported by the forward face;

a signal source for supplying the ultrasonic signal with the sonic signal to the emitter film; and

coupling means for coupling the signal source to the speaker device for supplying the variable voltage which includes the sonic signal.

95. A device as defined in claim 94, further comprising:

a second foam member having a forward face, an intermediate core section and a rear face, said forward face of the second foam member (referred to as the second forward face) being positioned on an opposing side of the electrostatic emitter film from the first foam member;

said second forward face being composed of a composition having sufficient stiffness to support the electrostatic film and including conductive properties which enable application of the variable voltage to the second forward face to supply the desired sonic signal;

said second forward face comprising a surface including small cavities having surrounding wall structure defining each cavity, said surrounding wall

structure terminating at contacting edges approximately coincident with the forward face of the foam member;

film application means for applying the electrostatic film to the forward face of the second foam member;

said biasing means being coupled to the second foam member for biasing the film in direct contact with the contacting edges of the second forward face such that the film is directly supported by the second forward face;

said coupling means including means for coupling the signal source to the second forward face with the variable voltage which includes the sonic signal;

said electrostatic emitter film including a conductive layer in non-contacting relationship with the respective first and second foam members for enabling the film to capacitively respond with the first and second forward faces to the variable voltage in a push-pull relationship.

96. A device as defined in claim 94, further comprising:

a second foam member having a forward face, an intermediate core section and a rear face, said forward face of the second foam member (referred to as the second forward face) being positioned on an opposing side of the electrostatic emitter film from the first foam member;

said second foam member being composed of a composition having sufficient stiffness to support the electrostatic film and including conductive properties which enable application of the variable voltage to supply the desired sonic signal;

said second forward face comprising a surface including small cavities having surrounding wall structure defining each cavity, said surrounding wall structure terminating at contacting edges approximately coincident with the forward face of the foam member;

film application means for applying the electrostatic film to the forward face of the second foam member;

said biasing means being coupled to the second foam member for biasing the film in direct contact with the contacting edges of the second forward face such that the film is directly supported by the second forward face;

said coupling means including means for coupling the signal source to the second foam member with the variable voltage which includes the sonic signal.

97. A device as defined in claim 96, wherein the electrostatic emitter film comprises a conductive layer biased in contacting relationship with the respective first and second foam members for enabling the film to capacitively respond with the first and second forward faces to the variable voltage in a push-pull relationship.

98. An emitter device for generating parametric audio output based on an interaction of multiple ultrasonic frequencies to produce sonic or subsonic signals within air as a nonlinear medium, said device comprising:

a core member having means for establishing a first magnetic field adjacent the core member;

a movable film diaphragm extending along the core member and displaced a short separation distance from the core member to allow an intended range of orthogonal displacement of the diaphragm with respect to the core member and within a strong portion of the first magnetic field;

at least one, low mass, planar, conductive coil disposed on the movable diaphragm and including first and second contacts for enabling current flow through opposing ends of the coil; and

means for supplying variable current flow to the at least one coil for developing a second magnetic field which variably interacts with the first magnetic field to attract and repel the diaphragm at a desired frequency for development of a series of compression waves which may be adjusted to include an ultrasonic frequency range.

99. A device as defined in claim 98, wherein the permanent magnet comprises a rigid plate of magnetic material having dimensions slightly larger than dimensions of an active emitting surface of the emitter device.

100. A device as defined in claim 98 herein the core member comprises a rigid plate formed of nonmagnetic composition, one surface of the plate including at least one opposing conductive coil having first and second contacts for enabling current flow through the opposing conductive coil.

101. A device as defined in claim 100 wherein the at least one opposing conductive coil is positioned on the rigid plate in a location which is juxtaposed

to the at least one conductive coil on the movable diaphragm to enable the at least one conductive coil and at least one opposing conductive coil to cause respective magnetic fields from each coil to interact to develop the compression waves.

102. A device as defined in claim 98, wherein the diaphragm comprises a thin film, said at least one coil being disposed on one side of the film.

103. A device as defined in claim 102, wherein the film comprises a polymer having isotropic properties across its surface to provide a uniform response to applied tension.

104. A device as defined in claim 98, wherein the at least on conductive coil comprises a plurality of voice coils, each voice coil including a support perimeter in contact with the diaphragm and providing means for substantially isolating displacement of the diaphragm at each coil from adjacent coils.

105. A device as defined in claim 104, wherein the support perimeter for isolating the coils comprises a grid configuration defining a plurality of open displacement cavities at a surface of the core member adjacent to the diaphragm, each cavity being aligned with one of the conductive coils.

106. A device as defined in claim 105, wherein the means for providing the first magnetic field comprises a variable current flow to the at least one coil at the core in a phase inverted relationship with the variable current applied to develop

the second magnetic field to thereby enhance the attraction and repulsion of the diaphragm for development of a series of compression waves which may be adjusted to include the ultrasonic frequency range.

107. A method for generating parametric audio output based on an interaction of multiple ultrasonic frequencies to produce sonic or subsonic signals within air as a nonlinear medium, yet having a capacity for relatively large diaphragm displacement as compared to lesser movement of a typical electrostatic diaphragm movement, the method comprising the steps of:

(a) providing a first magnetic field adjacent a supporting core member;

(b) applying at least one conductive coil to a movable diaphragm extending along the core member and displaced a short separation distance from the core member to allow an intended range of orthogonal displacement of the diaphragm with respect to the core member and within a strong portion of the first magnetic field; and

(c) supplying variable current flow to the at least one coil for developing a second magnetic field which variably interacts with the first magnetic field to attract and repel the diaphragm at a desired frequency for development of a series of compression waves which may be adjusted to include an ultrasonic frequency range.

108. An ultrasonic emitter device for generating parametric audio output based on an interaction of multiple ultrasonic frequencies to produce sonic or subsonic signals within air as a nonlinear medium, yet having broad frequency range

capacity with relatively large diaphragm displacement compared to typical electrostatic diaphragm movement, said device comprising:

a core member having means for establishing a variable magnetic field adjacent the core member;

a movable diaphragm disposed in tension along the core member and displaced a short separation distance from the core member to allow an intended range of orthogonal displacement of the diaphragm with respect to the core member and within a strong portion of the variable magnetic field; and

at least one conductive ring disposed on the movable diaphragm for enabling current flow in an orientation which develops a counter, opposing magnetic force which is repelled by the variable magnetic field of the core member at a desired frequency for development of a series of compression waves which may be adjusted to include an ultrasonic frequency range.

109. A device as defined in claim 108, wherein the core member comprises an electromagnet.

110. A device as defined in claim 109, wherein the rigid plate comprises a flat plate with uniform variable magnetic field along a surface of the plate most adjacent the movable diaphragm.

111. A device as defined in claim 108, wherein the core member comprises a rigid plate formed of nonmagnetic composition, one surface of the plate including

at least one opposing conductive coil having first and second contacts for enabling current flow through the conductive coil.

112. A device as defined in claim 111, wherein the at least one conductive coil is positioned on the rigid plate in a location which is juxtaposed to the at least one conductive ring on the movable diaphragm to enable the at least one conductive coil and at least one opposing conductive ring to cause opposing magnetic fields to interact to develop the compression waves.

113. A device as defined in claim 108, wherein the diaphragm comprises a thin film, said at least one ring being disposed on one side of the film.

114. A device as defined in claim 111, wherein the film comprises a polymer having isotropic resilient properties across its surface to provide a uniform response to applied tension.

115. An ultrasonic emitter device for converting electrical signals to audio output by acoustic heterodyning of ultrasonic emissions, said device comprising:

a rigid core member having a top surface which includes an array of cavities of predetermined size and including means for enhancement of at least one resonant frequency operable as a carrier frequency within an ultrasonic frequency range;

means for developing an electrostatic field at the top surface of the core member;

a resilient, dielectric diaphragm disposed in tension along the top surface and across the cavities of the core member to allow an intended range or orthogonal displacement of emitting sectors of the diaphragm which are positioned over the cavities of the core member and within a strong portion of the electrostatic field;

a conductive medium applied to one face of the diaphragm and electrically isolated from the core member; and

modulating means coupled to the conductive medium for enabling a variable electrostatic field to be applied to the diaphragm which interacts with the electrostatic field of the core member to develop a series of ultrasonic compression waves emanating from the emitting sectors of the diaphragm within the desired ultrasonic frequency range which propagate the series of ultrasonic compression waves which are demodulated within a nonlinear air medium to generate audio output.

116. A device as defined in claim 115, wherein the core member includes an array of cavities having uniform concave configurations which are generally tuned to a common resonant frequency.